

Satellite and Spacecraft Radio Transmission Frequencies

This frequency list includes satellites and spacecraft tracked from the Zarya home location, with additional information from other observers that is credited appropriately. Some of the frequencies have been used by past satellites but generally only transmissions logged since the year 2000 are listed here.

NOTE: All frequencies based on observations from the Zarya location are Doppler corrected to give the true transmission frequency. Where another source gives a frequency near to, but different from, a frequency listed here, it is probably a received frequency which includes a Doppler shift.

Specifically excluded from being listed are amateur radio satellites, the US military VHF communications transponders near 250 MHz aboard geosynchronous satellites, and the plethora of transmitters near 435 MHz.

Frequencies

Freq (MHz)	Satellite	Transmission	Notes
121.500	Soyuz TMA-M	Morse code 'AN' recovery beacon and direction finding for recovery teams	ISS Crew ferry: Digital control system, three crew seats, from 2011 - NOTE: this is an international distress frequency
121.750	Soyuz TMA-M	30 kHz deviation FM voice	ISS Crew ferry: Digital control system, three crew seats, from 2011
130.167	ISS 1998-067A 25544	Medium bandwidth FM voice	Space station: VHF-2 channel for Russian segment, used as an alternative to VHF-1 (143.625 MHz) during Shuttle/ISS on-orbit operations
130.167	ISS 1998-067A 25544	Ranging pulses	Space station: Used by TORU remote control docking system on the Russian segment, usually tested 1-2 days before a Progress docking is due, the Progress return path is at 121.750 MHz
136.235	TIROS 10 1965-051A 1430	AM - 1.3 kHz tone	Meteorology: Payload now inactive, radio transmission is not continuous - (information contributed by Michael D Kenny)
136.260	ERS 20 1967-040D 2768	AM - tone (unstable)	USAF test satellite: High orbit, visible for long periods of time - (information contributed by Michael D Kenny)
136.410	Isis 1 1969-009A 3669	CW	Ionosphere studies: (information contributed by Michael D Kenny)
136.440	ERS 15 1966-077C 2412	AM with 1.3 kHz tone	Military satellite: Incorrectly catalogued by NORAD as SECOR 7 - (information contributed by Michael D Kenny)
136.500	Nimbus 4 1970-025A 4362	CW - sometimes modulated	Meteorology (including imaging): Payload no longer operational - (information contributed by Michael D Kenny)
136.650	NNS O-2 1964-083D 965	CW Carrier plus telemetry tones	Navigation: Second operational TRANSIT navsat, navigation system failed soon after launch but transmitter is still active (information contributed by Michael D Kenny)
136.695	Shinsei 1971-080A 5485	CW	Japanese scientific satellite: Continuous transmission - (information contributed by Michael D Kenny)
136.770	NOAA 9 1984-123A 15427	CW	Formerly meteorological imaging: Telemetry frequency, transmission is intermittent - (information contributed by Michael D Kenny) - Also has a transmission at 137.500 MHz
136.800	Solrad 7B 1965-016D	AM IRIG telemetry channels	Solar radiation studies (launched 1969): Continuous transmission - (information contributed by Michael D Kenny)

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	1291		
137.080	OPS 7898-2 1971-110C 5680	CW	US military satellite: (information contributed by Michael D Kenny)
137.100	NOAA 18 2005-018A 28654	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Revised frequency as of 2006 Jan 4, changed from 137.9125 MHz
137.142	Eutelsat I F4 1987-078B 18351	CW	Defunct comsat: Regular, intermittent signal possibly due to vehicle rotation causing periodic flow of power from solar panels
137.200	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies, individual satellites switch between them - Also transmits at 400.100 MHz
137.225	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies, individual satellites switch between them - Also transmits at 400.100 MHz
137.250	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies, individual satellites switch between them - Also transmits at 400.100 MHz
137.300	Russian Imaging	APT at 2 lines per second	Meteorological and remote sensing imaging: Frequency not currently active
137.350	NOAA 15 1998-030A 25338	CW Doppler Beacon and telemetry	Meteorological imaging: Continuous transmission -(information contributed by Michael D Kenny) - Also transmits at 137.500 MHz
137.350	NOAA 16 2000-055A 26536	CW Doppler Beacon and telemetry	Formerly meteorological imaging: Continuous transmission - (information contributed by Michael D Kenny) - Also transmits at 137.500 MHz
137.350	Compass 2 2006-019A 29157	CW/AM	Russian scientific satellite studying possible ways of predicting earthquakes - not operating properly: After launch on 2006 May 26 - bursts of CW tone one to ten seconds duration in groups with peaks at central frequency and +/- 64 kHz - As of 2006 Nov 16 - data transmission at 64 kHz side bands only
137.380	OPS 7613-1 1969-082B 4256	Mixed modulation (PAM/FM/AM)	Navigation technology: (information contributed by Michael D Kenny)
137.400	Russian Imaging	APT at 2 lines per second	Meteorological and remote sensing imaging: Frequency not currently active
137.410	OPS 7613-6 1969-082E 4237	CW	USAF test satellite: (information contributed by Michael D Kenny)
137.440	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies, individual satellites switch between them - Also transmits at 400.100 MHz
137.460	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies, individual satellites switch between them - Also transmits at 400.100 MHz

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137.500	TIROS-N 1978-096A 11060	CW - carrier only	Meteorological imaging: Inactive satellite but reportedly transmitting
137.500	NOAA 6 1979-057A 11416	CW - carrier only	Meteorological imaging: Inactive satellite but reportedly transmitting
137.500	NOAA 9 1984-123A 15427	Tone for 6 seconds out of every 25 seconds (periods vary - these are averages)	Formerly meteorological imaging: Non-operational satellite but transmitter still had power long after the payload was switched off - Timings shown are as of 2001 January 6 - Probably no longer transmitting at this frequency - Also has a transmission at 136.770 MHz
137.500	NOAA 12 1991-032A 21263	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Switched off occasionally when transmissions conflict with those from NOAA 15 - Also transmits at 137.770 MHz - De-commissioned 2007 Aug 10
137.500	NOAA 15 1998-030A 25338	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Switched off occasionally when transmissions conflict with those from NOAA 12 - Also transmits at 137.350 MHz
137.625	NOAA 14 1994-089A 23455	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Switched off occasionally when transmissions conflict with those from NOAA 17 - Also transmits at 137.770 MHz - Decommissioned 2007 May 23
137.625	NOAA 17 2002-032A 27453	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Switched off occasionally when transmissions conflict with those from NOAA 14
137.663	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies - individual satellites switch between them - Also transmits at 400.100 MHz
137.688	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies - individual satellites switch between them - Also transmits at 400.100 MHz
137.713	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies - individual satellites switch between them - Also transmits at 400.100 MHz
137.738	Orbcomm	Digital data - transmitted to/from mobile terminals	Mobile telephony: One of several frequencies - individual satellites switch between them - Also transmits at 400.100 MHz
137.770	NOAA 11 1988-089A 19531	CW Doppler Beacon and telemetry	Meteorological imaging: Continuous transmission when operational - (information contributed by Michael D Kenny) - De-commissioned 2004 June 16
137.770	NOAA 12 1991-032A 21263	CW Doppler Beacon and telemetry	Meteorological imaging: Also transmitted at 137.500 MHz - De-commissioned 2007 Aug 10
137.770	NOAA 14 1994-089A 23455	CW Doppler Beacon and telemetry	Meteorological imaging: Also transmits at 137.625 MHz - Decommissioned 2007 May 23
137.770	NOAA 17 2002-032A 27453	CW Doppler Beacon and telemetry	Meteorological imaging: Also transmits at 137.625 MHz
137.800	Orbcomm	Digital data -	Mobile telephony: One of several frequencies - individual satellites

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		transmitted to/from mobile terminals	switch between them - Also transmits at 400.100 MHz
137.850	Russian Imaging	APT at 2 lines per second	Meteorological and remote sensing imaging: Frequency not currently active
137.913	NOAA 18 2005-018A 28654	APT at 4 lines per second - interlaced visible light and infrared images	Meteorological imaging: Frequency probably not active - changed to 137.100 MHz (2006 Jan 4?)
143.625	ISS 1998-067A 25544	Medium bandwidth FM voice	Space station: Russian segment VHF-1 channel for communication with Moscow, also used to relay Mission Control to the Shuttle during docking. Used as part of the ISS Early Communications System over the USA working with the Wallops Facility and White Sands and still used there occasionally but mainly in test mode. Sven Grahn detected it carrying packet data transmissions during Expedition 1.
145.800	ISS 1998-067A 25544	Amateur Radio downlink frequency	Space station: Amateur radio downlink from US segment - see NASA's ARISS Page
145.825	ISS 1998-067A 25544	Amateur Radio downlink frequency	Space station: Amateur radio downlink from US segment - see NASA's ARISS Page
145.919	Kedr 1998-067CK 37772	CW - morse code telemetry	Amateur radio satellite released during Russian EVA from ISS 2011 Aug 3, still operating at the time of re-entry: Only transmitted at this frequency when 145.950 MHz was being used for BPSK-1000 digital telemetry transmission
145.939	Kedr 1998-067CK 37772	CW - morse code telemetry	Amateur radio satellite released during Russian EVA from ISS 2011 Aug 3, still operating at the time of re-entry: Only used when the digital telemetry system switched to backup BPSK-400 mode
145.950	Kedr 1998-067CK 37772	Automatic switching between several transmission modes including BPSK telemetry	Amateur radio satellite released during Russian EVA from ISS 2011 Aug 3, still operating at the time of re-entry: Ceased to operate on re-entry 2012 Jan 4
145.990	Suitsat 2005-035C 28933	NFM - extremely weak	Amateur radio experiment - life expired Orlan spacesuit equipped with a radio transmitter and released from ISS during a crew EVA: Voice recording + SSTV image - the low power was due to a failed amplifier - Released from ISS 2006 Feb 3 and battery exhausted 2006 Feb 18
149.665	Cosmos 2463 2010-017A 36519	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Duplicate of the standard 149.940 MHz transmission at a frequency 275 kHz below it. The transmitter is faulty.
149.910	Cosmos 2341 1997-017A 24772	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.920 MHz
149.910	Cosmos 2398 2003-023A 27818	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.760 MHz

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149.940	Cosmos 2378 2001-023A 26818	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.840 MHz
149.940	Cosmos 2454 2009-039A 35635	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.840 MHz
149.940	Cosmos 2463 2010-017A 36519	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.840 plus duplicated transmissions at other frequencies around 150 and 400 MHz . The transmitter is faulty.
149.970	Cosmos 2336 1996-071A 24677	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.840 MHz
149.970	Cosmos 2389 2002-026A 27436	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Transmission contains an almanac for all active satellites in the constellation - coherent transmission at 399.920 MHz
149.979	Oscar 29 1987-080B 18362	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Maintenance frequency - Coherent transmission at 399.944 MHz (has been heard to transmit tones similar to the other OSCAR satellite but 2003 December 28 - this frequency was occupied by a modulated 'buzzing' signal - No longer transmitting as of 2008 Feb 1
149.979	Oscar 31 1988-074B 19420	FM telemetry (tones) +/- 2.4 kHz from carrier	Ionospheric modelling for US military (NIMS): Maintenance frequency - Coherent transmission at 399.944 MHz - Occasionally changes between this frequency and the operational one - Sometime between 2007 Dec 21 and 2008 Feb 7, the normal transmissions at both frequencies were replaced with a highly unstable CW carrier (wandering frequency + variations in strength)
149.988	Oscar 27 1987-080A 18361	FM telemetry (tones) +/- 2.4 kHz from carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 399.968 MHz - Occasionally changes between this frequency and the maintenance one) - No longer transmitting as of 2008 Jan 1
149.988	Oscar 23 1988-033A 19070	FM telemetry (tones) +/- 2.4 kHz from carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 399.968 MHz - Occasionally changes between this frequency and the maintenance one)
149.988	Oscar 32 1988-033B 19071	FM telemetry (tones) +/- 2.4 kHz from carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 399.968 MHz - Occasionally changes between this frequency and the maintenance one)
149.988	Oscar 25 1988-074A 19419	FM telemetry (tones) +/- 2.4 kHz from carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 399.968 MHz - Occasionally changes between this frequency and the maintenance one)
150.000	Nadezhda	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Navigation - plus Search and Rescue monitoring: Several satellites - the system is no longer operational, has been silent since 2003 November 26 - Coherent transmission at 400.000 MHz
150.000	Tsikada	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Navigation - plus Search and Rescue monitoring: Several satellites - the system is no longer operational, has been silent since 2003 November 26 - Coherent transmission at 400.000 MHz

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150.012	Unknown	'Wandering' CW	Unidentified satellite: Satellite in GEO, possibly graveyard orbit, also transmits 400.032 MHz
150.012	Geosat 1985-021A 15595	CW - Doppler tracking beacon	Oceanography - wave height measurement: Detected being switched on and off over Europe, not continuously active. Sometime around 2007, transmissions ceased to be detected but Geosat was subsequently determined to be transmitting continuously while in sunlight. Coherent transmission at 400.032 MHz
150.012	RADCAL 1993-041A 22698	CW - Doppler tracking beacon	Radar calibration: Radar Calibration satellite - Coherent transmission at 400.032 MHz, operation is intermittent
150.012	GFO 1998-007A 25157	CW - Doppler tracking beacon	Oceanography - wave height measurement: Geosat Follow On satellite - Coherent transmission at 400.032 MHz and also transmitted at 2207.5 MHz. Ceased to transmit 2008 November.
150.012	ARGOS 1999-008A 25634	CW - Doppler tracking beacon	USAF space experiments: Coherent transmission at 400.032 MHz - Ceased to transmit 2003
150.012	USA 147 1999-067A 25991	CW - Doppler tracking beacon	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2207.535 MHz, 2237.5 MHz and 2252.5 MHz, and 400.032 MHz - Post-launch testing revealed interference with other equipment from the 150/400 MHz transmitters so they remained inactive (apart from further testing) until 2006 Aug 14
150.012	Picosat 9 2001-043B 26930	CW - Doppler tracking beacon	USAF Space Test Program (STEP): Coherent transmission at 400.032 MHz - Ceased to transmit late-2004
150.012	Formosat 3A 2006-011A 29047	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032 MHz and 1066.752 MHz
150.012	Formosat 3B 2006-011B 29048	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032 MHz and 1066.752 MHz
150.012	Formosat 3C 2006-011C 29049	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032MHz and 1066.752 MHz
150.012	Formosat 3D 2006-011D 29050	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032 MHz and 1066.752 MHz
150.012	Formosat 3E 2006-011E 29051	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032 MHz and 1066.752 MHz
150.012	Formosat 3F 2006 29052	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 400.032 MHz and 1066.752 MHz
150.030	Cosmos 2361 1998-076A 25590	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Coherent transmission at 400.080 MHz

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150.215	Cosmos 2463 2010-017A 36519	FM time and position information - sidebands at 3 kHz, 5 kHz and 7 kHz	Positional signal transmissions and store/forward comms: Duplicate of the standard 149.940 MHz transmission at a frequency 275 kHz above it. The transmitter is faulty.
150.300	Cosmos 2373 2000-058A 26552	AM telemetry - wide bandwidth	Photographic mapping: Coherent transmission at 400.800 MHz - Cameras and film recovered after mission running between 2000 September 29 and 2000 November 14 - no longer in orbit
150.300	Cosmos 2415 2005-034A 28841	CW - Doppler tracking beacon	Photographic reconnaissance: Coherent transmission at 400.800 MHz - Cameras and film recovered after mission running between 2005 September 2 and 2005 October 14 - transmissions heard over the USA - no longer in orbit
166.000	Soyuz TMA-M	Telemetry transmission PCM-FM, sidebands ± 128 kHz	ISS Crew ferry: Digital control system, three crew seats, from 2011
166.000	Progress M-M	Telemetry transmission PCM-FM, sidebands ± 128 kHz	ISS supplies ferry: 2008-
179.951	Zi Yuan 2 2000-050A 26481	CW carrier on centre frequency plus telemetry sidebands at ± 20 kHz- and further carriers at ± 40 kHz	Remote Sensing: Coherent transmission at 479.865 MHz. No longer transmitting.
180.006	Fengyun 1C 1999-025A 25730	CW carrier on centre frequency plus telemetry sidebands at ± 5 kHz- and further carriers at ± 10 kHz	Meteorological imaging: Active transmitter until 2007 February when attacked in ground-based interceptor test - Coherent transmission at 480.017 MHz
180.007	Fengyun 1D 2002-024B 27431	CW carrier on centre frequency plus telemetry sidebands at ± 5 kHz- and further carriers at ± 10 kHz	Meteorological imaging: Coherent transmission at 480.017 MHz, also transmits 2201.050 MHz
180.011	CBERS 1 1999-057A 25940	CW carrier on centre frequency plus telemetry sidebands at ± 20 kHz - and further carriers at ± 40 kHz	Remote sensing: China Brazil Earth Resources Satellite - Coherent transmission at 480.025 MHz - Silent since mid 2003, the last public report being 2003 Jun 6 by Maik Hermenau of www.satellitenwelt.de
180.013	CBERS 2B 2007-042A 32062	CW carrier on centre frequency plus telemetry sidebands at ± 20 kHz- and further carriers at ± 40 kHz	Remote sensing: China Brazil Earth Resources Satellite - Coherent transmission at 480.033 MHz, also transmits 2204.400 MHz and 2267.500 MHz. No longer transmitting - switched off 2010 May 10 after an operating anomaly was detected 2010 March.
180.014	CBERS 2 2003-049A 28057	CW carrier on centre frequency plus telemetry sidebands at ± 20 kHz- and further carriers at ± 40 kHz	Remote sensing: China Brazil Earth Resources Satellite - Coherent transmission at 480.037 MHz, also transmits 2204.400 MHz and 2267.500 MHz, ceased to transmit 2007
243.000	Shenzhou	Signal content not known	Piloted spacecraft: Recovery beacon transmitted during descent under parachute - NOTE: this is an international distress frequency
243.695	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 1, no longer transmitting.

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243.695	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 1, no longer transmitting.
243.705	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 2, no longer transmitting.
243.705	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 2, no longer transmitting.
243.710	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 3, no longer transmitting.
243.710	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 3, no longer transmitting.
243.715	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 4, no longer transmitting.
243.715	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 4, no longer transmitting.
243.720	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 5, no longer transmitting.
243.720	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 5, no longer transmitting.
243.725	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 6, no longer transmitting.
243.725	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 6, no longer transmitting.
243.730	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 7, no longer transmitting.
243.730	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 7, no longer transmitting.
243.735	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 8, no longer transmitting.
243.735	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 8, no longer transmitting.
243.740	USA 125 1996-038A 23945	Channel usually occupied by an unmodulated carrier	US comms and intelligence gathering: AFSATCOM Channel 9, no longer transmitting.
243.740	USA 137 1998-005A	Channel usually occupied by an	US comms and intelligence gathering: AFSATCOM Channel 9, no longer transmitting.

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	25148	unmodulated carrier	
243.745	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 10, no longer transmitting.
243.745	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 10, no longer transmitting.
243.750	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 11, no longer transmitting.
243.750	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 11, no longer transmitting.
243.760	USA 125 1996-038A 23945	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 12, no longer transmitting.
243.760	USA 137 1998-005A 25148	CW - RTTY-style data	US comms and intelligence gathering: AFSATCOM Channel 12, no longer transmitting.
243.825	USA 99 1994-009A 22988	Spread spectrum signal - +/- 64 kHz from centre frequency	Military geosynchronous comsat at 39° west longitude: Tentative identification (may be more than one satellite) in geosynchronous orbit, can be heard with relatively simple receiver/antenna setup - in CW mode, it sounds like trickling water!
244.512	Cosmos 2385 2001-058B 27056	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Gonets D1-8 2001-058E 27059	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz. This is a Stela-3 even though listed elsewhere as Gonets-D1. There was a NORAD name mix-up with Cosmos 2386.
244.512	Cosmos 2390 2002-036A 27464	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2391 2002-036B 27465	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2400 2003-037A 27868	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2408 2004-037A 28419	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2409 2004-037B 28420	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.

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244.512	Cosmos 2437 2008-025B 32954	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2438 2008-025C 32955	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2439 2008-025D 32956	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2451 2009-036A 35498	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Cosmos 2453 2009-036C 35500	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.512	Strela-3 2010-043B 37153	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 261.035 MHz.
244.999	Cosmos 2467 2010-043A 37152	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 388.688 MHz.
244.999	Cosmos 2468 2010-043C 37154	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 388.688 MHz.
245.157	Gonets D1-1 1996-009A 23787	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-2 1996-009B 23788	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-4 1997-006D 24728	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-5 1997-006E 24729	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-6 1997 24730	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Cosmos	Message Signal every	Store and Forward communications: Stored messages are

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	2386 2001-058C 27057	60s, silent when receiving data message from ground	transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-7 2001-058D 27058	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
245.157	Gonets D1-9 2001 27060	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at another frequency in the 240-260 MHz band
250.075	USA 162 2001-046A 26948	AM - 4.8 kHz data tone	US intelligence-related satellite near 144° west longitude, possibly including communications: One of a triplet of reported frequencies carrying similar signals from satellite in geosynchronous orbit, exact frequency not known - also reported to transmit at 256.475, 263.225, 267.550 MHz and 2242.5 MHz
250.150	USA 76 1991-076D 21808	CW carrier detectable at 250.158 MHz then a series weaker carriers up and down from this frequency at 9.6 kHz intervals between approximate limits of 250.0 and 250.25 MHz	US Military ocean surveillance: Navy Ocean Surveillance System, transmission is probably from a secondary payload - Transmission intermittent - First reported 2005 September then went into a period of silence - (the listed satellite is one of a cluster)
250.158	USA 121 1996-029D 23862	AM - 4.8 kHz data tone	US Military ocean surveillance: Navy Ocean Surveillance System, transmission is probably from a secondary payload and is on for extended periods - no reports of any switch on/off activity - (the listed satellite is one of a cluster)
251.275	USA 198 2007-060A 32378	AM - 4.8 kHz data tone plus various test modes	Intelligence-related satellite, possibly including communications: One of a pair of transmissions from a secondary payload on US classified satellite in HEO used during the test phase of the satellite up until 2008 March 13 - on March 14, USA-198 switched to its operational frequencies at 251.700 MHz and 256.375 MHz, test transmission also at 258.800 MHz, plus transmitter at 2242.50 MHz
251.325	USA 155 2000-080A 26635	AM - 4.8 kHz data tone	US intelligence-related satellite near 10° west longitude: One of a triplet of similar of transmissions from a secondary payload on a US classified satellite in GEO, signal appears to be continuous and is similar to ones from USA-179 - Also transmits at 252.675 MHz, 258.775 MHz, 268.6755 MHz and 2242.486 MHz. No longer operational.
251.700	USA 179 2004-034A 28384	AM - 4.8 kHz data tone	US intelligence-related satellite: One of a pair of transmissions from a secondary payload on US classified satellite in HEO - Switched on and off to co-ordinate coverage with USA-198 - Prior to 2008 Mar 14, USA-179 was operating alone and was providing near 8 hours' coverage per pass at this frequency - Also transmits at 256.375 MHz and 2242.50 MHz
251.700	USA 198 2007-060A 32378	AM - 4.8 kHz data tone	Intelligence-related satellite, possibly including communications: One of a pair of transmissions from a secondary payload on US classified satellite in HEO - Switched on and off to co-ordinate coverage with USA-179 - Also transmits at 256.375 MHz and 2242.50 MHz
252.675	USA 155 2000-080A 26635	AM - high speed (19.2 kb/s?) data transmission	US intelligence-related satellite near 10° west longitude: Transmissions from a secondary payload on a US classified satellite in GEO, signal appears to be continuous - Also transmits at 251.325 MHz, 258.775 MHz, 268.675 MHz and 2242.486 MHz. No longer operational.

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256.375	USA 179 2004-034A 28384	AM - 4.8 kHz data tone	US intelligence-related satellite: One of a pair of transmissions from a secondary payload on US classified satellite in HEO - Switched on and off to co-ordinate coverage with USA-198 - Prior to 2008 Mar 14, USA-179 was operating alone and was providing near 8 hours' coverage per pass at this frequency - Also transmits at 251.700 MHz and 2242.50 MHz
256.375	USA 198 2007-060A 32378	AM - 4.8 kHz data tone	Intelligence-related satellite, possibly including communications: One of a pair of transmissions from a secondary payload on US classified satellite in HEO - Switched on and off to co-ordinate coverage with USA-179 - Also transmits at 251.700 MHz and 2242.50 MHz
256.475	USA 162 2001-046A 26948	AM - 4.8 kHz data tone	US intelligence-related satellite near 144° west longitude, possibly including communications: One of a triplet of reported frequencies carrying similar signals from satellite in geosynchronous orbit, exact frequency not known - also reported to transmit at 250.075, 263.225, 267.550 MHz and 2242.5 MHz
258.150	USA 81 1992-023A 21949	AM - data plus modulated tones at 4.8 and 9.6 kHz	Electronic intelligence gathering: European observations indicates that it is switched on and off on command from ground stations in Italy and Spain - also transmits at 2202.5 MHz and 2257.53 MHz, no longer active
258.775	USA 155 2000-080A 26635	AM - 4.8 kHz data tone	US intelligence-related satellite near 10° west longitude: One of a triplet of similar of transmissions from a secondary payload on a US classified satellite in GEO, signal appears to be continuous and is similar to ones from USA-179 - Also transmits at 251.325 MHz, 252.675 MHz, 268.675 MHz and 2242.486 MHz. No longer operational.
258.800	USA 198 2007-060A 32378	AM - 4.8 kHz data tone plus various test modes	Intelligence-related satellite, possibly including communications: One of a pair of transmissions from a secondary payload on US classified satellite in HEO used during the test phase of the satellite up until 2008 March 13 - on March 14, USA-198 switched to its operational frequencies at 251.700 MHz and 256.375 MHz, sharing duties with USA-179 - Test transmission also at 251.275 MHz, plus transmitter also at 2242.50 MHz
259.700	STS	AM voice	ISS Crew/payload transport: Detected over Europe occasionally prior to Shuttle re-entry from ISS operations, and with voice during the orbital injection phase from Kennedy SC to Europe - also transmitted at 2217.500 MHz, 1981-2011
261.035	Cosmos 2385 2001-058B 27056	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Gonets D1-8 2001-058E 27059	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz. This is a Strela-3 even though listed elsewhere as Gonets-D1. There was a NORAD name mix-up with Cosmos 2386.
261.035	Cosmos 2390 2002-036A 27464	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2391 2002-036B 27465	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2400	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.

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	2003-037A 27868		
261.035	Cosmos 2408 2004-037A 28419	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2409 2004-037B 28420	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2437 2008-025B 32954	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2438 2008-025C 32955	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2439 2008-025D 32956	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2451 2009-036A 35498	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Cosmos 2453 2009-036C 35500	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
261.035	Strela-3 2010-043B 37153	Data transmission as messages are forwarded	Store and Forward communications: Message Signal at 244.512 MHz.
262.910	Gonets D1-6 1997 24730	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
262.910	Cosmos 2386 2001-058C 27057	Data transmission as messages are forwarded	Store and Forward communications: This is a Gonets-D1 even though listed elsewhere as Strela-3. There was a NORAD name mix-up with Gonets D1-8. Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
262.910	Gonets D1-7 2001-058D 27058	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
262.910	Gonets D1-9 2001 27060	Data transmission as messages are forwarded	Store and Forward communications: Frequency is changed occasionally - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
263.086	Gonets D1-1	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8.

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	1996-009A 23787		Message Signal at 261.035 MHz.
263.225	USA 162 2001-046A 26948	AM - high speed (19.2 kb/s?) data transmission	US intelligence-related satellite near 144° west longitude, possibly including communications: Reported frequency for a satellite in geosynchronous orbit, exact frequency not known - also reported to transmit at 250.075 MHz, 256.475, 267.550 MHz and 2242.5 MHz
264.400	Gonets D1-5 1997-006E 24729	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
264.750	Gonets D1-4 1997-006D 24728	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
265.059	Gonets D1-2 1996-009B 23788	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 8. Message Signal at 261.035 MHz.
265.137	Gonets D1-3 1996-009C 23789	Data transmission as messages are forwarded	Store and Forward communications: Has been reported on other frequencies in the past - entry updated 2009 Mar 13. May now be silent, no Message Signal detected 2009 Sept.
267.550	USA 162 2001-046A 26948	AM - 4.8 kHz data tone	US intelligence-related satellite near 144° west longitude, possibly including communications: One of a triplet of reported frequencies carrying similar signals from satellite in geosynchronous orbit, exact frequency not known - also reported to transmit at 250.075 MHz, 256.475 MHz, 263.225MHz and 2242.5 MHz
268.675	USA 155 2000-080A 26635	AM - 4.8 kHz data tone	US intelligence-related satellite near 10° west longitude: One of a triplet of similar of transmissions from a secondary payload on a US classified satellite in GEO, signal appears to be continuous and is similar to ones from USA-179 - Also transmits at 251.325 MHz, 252.675 MHz, 258.775 MHz and 2242.486 MHz. No longer operational.
388.688	Cosmos 2452 2009-036B 35499	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 244.999 MHz.
388.688	Cosmos 2467 2010-043A 37152	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 244.999 MHz.
388.688	Cosmos 2468 2010-043C 37154	Message Signal every 60s, silent when receiving data message from ground	Store and Forward communications: Stored messages are transmitted at 244.999 MHz.
388.688	Gonets M-3 2012-041B 38734	Message Signal every 60s or 120s depending on the operating mode, silent when receiving data message from ground.	Store and Forward communications: Stored messages are transmitted at 244.999 MHz.
388.688	Gonets M-4 2012-041D 38736	Message Signal every 60s or 120s depending on the operating mode,	Store and Forward communications: Stored messages are transmitted at 244.999 MHz.

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		silent when receiving data message from ground.	
399.150	Cosmos 2463 2010-017A 36519	CW carrier	Positional signal transmissions and store/forward comms: Duplicate of the standard 399.840 MHz transmission at a frequency 690 kHz below it. The transmitter is faulty.
399.703	Cosmos 2463 2010-017A 36519	CW carrier	Positional signal transmissions and store/forward comms: Duplicate of the standard 399.840 MHz transmission at a frequency 137 kHz below it. The transmitter is faulty.
399.760	Cosmos 2341 1997-017A 24772	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.910 MHz
399.760	Cosmos 2398 2003-023A 27818	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.910 MHz
399.840	Cosmos 2378 2001-023A 26818	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.940 MHz
399.840	Cosmos 2389 2002-026A 27436	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.940 MHz
399.840	Cosmos 2454 2009-039A 35635	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.940 MHz
399.840	Cosmos 2463 2010-017A 36519	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.940 MHz plus duplicated transmissions at other frequencies around 150 and 400 MHz due. The transmitter is faulty.
399.920	Cosmos 2336 1996-071A 24677	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Coherent transmission at 149.970 MHz
399.944	Oscar 29 1987-080B 18362	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Maintenance frequency - Coherent transmission at 149.979 MHz (known to change between this frequency and the operational one) - No longer transmitting as of 2008 Jan 1
399.944	Oscar 31 1988-074B 19420	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Maintenance frequency - Coherent transmission at 149.979 MHz (known to change between this frequency and the operational one) - Sometime between 2007 Dec 21 and 2008 Feb 7, the normal transmissions at both frequencies were replaced with a highly unstable CW carrier (wandering frequency + variations in strength)
399.968	Oscar 27 1987-080A 18361	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 149.988 MHz (known to change between this frequency and the maintenance one) - No longer transmitting as of 2008 Feb 1

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399.968	Oscar 23 1988-033A 19070	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 149.988 MHz (known to change between this frequency and the maintenance one)
399.968	Oscar 32 1988-033B 19071	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 149.988 MHz (known to change between this frequency and the maintenance one)
399.968	Oscar 25 1988-074A 19419	Modulated CW carrier	Ionospheric modelling for US military (NIMS): Operational frequency - Coherent transmission at 149.988 MHz (known to change between this frequency and the maintenance one)
399.977	Cosmos 2463 2010-017A 36519	CW carrier	Positional signal transmissions and store/forward comms: Duplicate of the standard 399.840 MHz transmission at a frequency 137 kHz above it. The transmitter is faulty.
400.000	Nadezhda	CW - Doppler tracking beacon	Navigation - plus Search and Rescue monitoring: Coherent transmission at 150.000 MHz - no longer active (see 150 MHz note)
400.000	Tsikada	CW - Doppler tracking beacon	Navigation - plus Search and Rescue monitoring: Coherent transmission at 150.000 MHz - no longer active (see 150 MHz note)
400.032	Unknown	'Wandering' CW	Unidentified satellite: Satellite in GEO, possibly graveyard orbit, also transmits 150.012 MHz
400.032	Geosat 1985-021A 15595	CW - Doppler tracking beacon	Oceanography - wave height measurement: Detected being switched on and off over Europe, not continuously active. Sometime around 2007, transmissions ceased to be detected but Geosat was subsequently determined to be transmitting continuously while in sunlight. Coherent transmission at 150.012 MHz
400.032	RADCAL 1993-041A 22698	CW - Doppler tracking beacon	Radar calibration: Radar Calibration satellite - Coherent transmission at 150.012 MHz, operation is intermittent
400.032	GFO 1998-007A 25157	CW - Doppler tracking beacon	Oceanography - wave height measurement: Geosat Follow On - Coherent transmission at 150.012 MHz and also transmitted at 2207.5 MHz. Ceased to transmit 2008 November.
400.032	ARGOS 1999-008A 25634	CW - Doppler tracking beacon	USAF space experiments: Coherent transmission at 150.012 MHz - Ceased to transmit 2003
400.032	USA 147 1999-067A 25991	CW - Doppler tracking beacon	Military meteorological satellite: Defense Meteorological Satellite Program - also transmits at 2207.535 MHz, 2237.5 MHz, and 150.012 MHz - Post-launch testing revealed interference with other equipment from the 150/400 MHz transmitters so they remained inactive (apart from further testing) until 2006 Aug 14 .
400.032	Picosat 9 2001-043B 26930	CW - Doppler tracking beacon	USAF Space Test Program (STEP): Detected being switched on and off over Europe, not continuously active - Coherent transmission at 150.012 MHz - Ceased to transmit late-2004
400.032	Formosat 3A 2006-011A 29047	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 1066.752 MHz
400.032	Formosat 3B 2006-011B 29048	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 1066.752 MHz
400.032	Formosat 3C	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits

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	2006-011C 29049		150.012 MHz and 1066.752 MHz, during 2007 December, Formosat 3C appeared to be about 5 kHz lower than the nominal frequency - the other frequencies may be shifted pro-rata
400.032	Formosat 3D 2006-011D 29050	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 1066.752 MHz
400.032	Formosat 3E 2006-011E 29051	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 1066.752 MHz
400.032	Formosat 3F 2006 29052	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 1066.752 MHz
400.080	Cosmos 2361 1998-076A 25590	CW - Doppler tracking beacon	Positional signal transmissions and store/forward comms: Non operational but still transmitting 2000 December 13 - Coherent transmission at 150.030 MHz
400.100	Orbcomm	CW - Doppler tracking beacon	Mobile telephony: Several satellites - Also transmitting digitised telephony signals at various frequencies 137-138 MHz (see individual entries)
400.117	Cosmos 2463 2010-017A 36519	CW carrier	Positional signal transmissions and store/forward comms: Duplicate of the standard 399.840 MHz transmission noted late-September 2010. The transmitter is faulty.
400.180	USA 217 2010-062A 37222	Trigger pulse for ground ground-based transmitters at 16s intervals	Military space technology experiments incl Store-Dump comms: Transmission from Ocean Data Telemetry Microsat Link payload to collect data from sensors on such as ocean data buoys or small, unattended ground stations. Transmits only when in range of an active sensor.
400.450	Akebono 1989-016A 19822	CW modulated	Studies of Magnetosphere and Ionosphere - Japan: Carrier with data modulation - appears as a tone modulated by a buzz
400.530	Cosmos 2463 2010-017A 36519	CW carrier	Positional signal transmissions and store/forward comms: Duplicate of the standard 399.840 MHz transmission at a frequency 690 kHz above it. The transmitter is faulty.
400.550	Resurs-O1 1998-043A 25394	CW Spread Spectrum	Remote sensing: Signals from Little LEO ranging between 400.318 and 400.787 MHz - Piggy-back 'store and forward' communications payload carried by Russian satellite - Transmitter not heard since 2001 February - The meteorological payload transmitted at 137.85 MHz - no longer active
400.552	Munin 2000-075C 26621	AM - modem-type databursts	Auroral research - Sweden: Telemetry but silent since 2001 Feb 12 (shortly after launch) probably due to onboard computer failure - no longer active
400.595	AprizeSat 2 2004-025A 28366	Data bursts, approx 35s intervals	Data comms: -
400.800	Cosmos 2373 2000-058A	CW - Doppler tracking beacon	Photographic mapping: Coherent transmission at 150.300 MHz - Cameras and film recovered after mission running between 2000 September 29 and 2000 November 14 - no longer active

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	26552		
400.800	Cosmos 2415 2005-034A 28841	CW - Doppler tracking beacon	Photographic reconnaissance: Coherent transmission at 150.300 MHz - Cameras and film recovered after mission running between 2005 September 2 and 2005 October 14? - no longer active
435.360	MiR 2012-041C 38735	Multiple side bands, varying data content	Technology: Noted while checking payloads of 2012-043 Launch
465.000	Omid 2009-004A 33506	AM - multiple sidebands with 25 kHz bandwidth	Testing comms up/down links: Switched on and off by onboard timer programmed from the ground
465.000	Rasad 1 2011-025A 37675		Testing gravity gradient stabilisation and, possibly, Earth imaging: Uplink at 401 MHz
465.000	Navid 2012-005A 38075		Imaging satellite: Images reported successfully returned, may only be transmitting over Iraq, uplink at 401 MHz
470.000	Kwangmyong song 3 2012	Mixed - music and telemetry	Remote sensing: Failed to reach orbit, the music consisted of songs in praise of Korean leaders Kim Jong Il and Kim Il Sung. The previous KMS satellite (2009) also failed to reach orbit and was reported to use the same frequency.
479.865	Zi Yuan 2 2000-050A 26481	CW - Doppler tracking beacon	Remote Sensing: Coherent transmission at at 179.951 MHz. No longer transmitting.
480.017	Fengyun 1D 2002-024B 27431	CW - Doppler tracking beacon	Meteorological imaging: Coherent transmission at 180.007 MHz, also transmits 2201.050 MHz
480.019	Fengyun 1C 1999-025A 25730	CW - Doppler tracking beacon	Meteorological imaging: Active transmitter until 2007 February when attacked in ground-based interceptor test - Coherent transmission at 180.007 MHz
480.025	CBERS 1 1999-057A 25940	CW - Doppler tracking beacon	Remote sensing: China Brasil Earth Resources Satellite - Coherent transmission at 180.011 MHz - silent since mid-2003
480.033	CBERS 2B 2007-042A 32062	CW - Doppler tracking beacon	Remote sensing: China Brazil Earth Resources Satellite - Coherent transmission at 180.013 MHz, also transmits at 2204.400 MHz and 2267.500 MHz. No longer transmitting - switched off 2010 May 10 after an operating anomaly was detected 2010 March
480.037	CBERS 2 2003-049A 28057	CW - Doppler tracking beacon	Remote sensing: China Brazil Earth Resources Satellite - Coherent transmission at 180.014 MHz, also transmits 2204.400 MHz and 2267.500 MHz, ceased to transmit 2007
628.000	ISS 1998-067A 25544	FM telemetry - sidebands at +/- 128 kHz	Space station: Transmission from the Zvezda module. Transmits on command from within Russia, several times per day - usually in parallel with 630 MHz - Similar transmission format to Soyuz/Progress at 166 MHz but with lower power - part of the BITS telemetry system.
630.000	ISS 1998-067A 25544	FM telemetry - sidebands at +/- 128 kHz	Space station: Transmission from the Zvezda module. Transmits on command from within Russia, several times per day - usually in parallel with 628 MHz - Similar transmission format to Soyuz/Progress at 166 MHz but with lower power - part of the BITS telemetry system.

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632.000	ISS 1998-067A 25544	FM telemetry - sidebands at +/- 128 kHz	Space station: Transmission from the Zarya module. Transmissions originally reported by Sven Grahn when Zarya first reached orbit - Similar transmission format to Soyuz/Progress at 166 MHz but with lower power - part of the BITS telemetry system and probably no longer in use
633.909	ISS 1998-067A 25544	FM telemetry - sidebands at +/- 128 kHz	Space station: Transmission from the Zarya module. The central frequency is 91 kHz lower than what might be regarded as the norm for this type of transmission. Transmissions originally reported by Sven Grahn when Zarya first reached orbit - similar transmission format to Soyuz/Progress at 166 MHz but with lower power - part of the BITS telemetry system. Transmissions are infrequent.
922.763	Soyuz TMA-M	CW carrier.	ISS Crew ferry: Part of the REGUL command and control system - there may be other elements of signals on sidebands around this frequency. Digital control system, three crew seats, from 2011
922.763	Progress M-M	CW carrier.	ISS supplies ferry: Part of the REGUL command and control system - there may be other elements of signals on sidebands around this frequency. 2008-
1018.500	Briz-M	CW carrier plus sidebands	Space launcher: Final launch vehicle stage, also transmits 1020.5 MHz - first tracked by Sven Grahn
1020.500	Briz-M	CW carrier plus sidebands	Space launcher: Final launch vehicle stage, also transmits 1018.5 MHz - first tracked by Sven Grahn
1066.752	Formosat 3A 2006-011A 29047	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
1066.752	Formosat 3B 2006-011B 29048	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
1066.752	Formosat 3C 2006-011C 29049	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
1066.752	Formosat 3D 2006-011D 29050	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
1066.752	Formosat 3E 2006-011E 29051	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
1066.752	Formosat 3F 2006 29052	CW	Atmospheric studies: Switched on when observation required, European observations usually 08:00-17:00 UTC Mon-Fri, also transmits 150.012 MHz and 400.032 MHz
2200.647	Meteor M-1 2009-049A 35865	CW	Meteorology: Appears to be continuous transmission - first noted 2010 September
2201.050	Fengyun 1D 2002-024B	CW	Meteorological imaging: Appears to be continuous transmission - first noted 2010 September, also transmits 180.007 and 480.017 MHz

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	27431		
2202.447 SGLS 1	Sicral 1A 2001-005A 26694	CW carrier plus sub-carriers at 293kHz and 297 kHz	Geosynchronous orbit comsat: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2202.507 SGLS 1	USA 32 1988-078A 19460	CW carrier plus side-bands	Electronic intelligence gathering: Also transmits at 2282.5 MHz but transmissions at the two frequencies are not simultaneous
2202.513 SGLS 1	USA 81 1992-023A 21949	CW carrier plus side-bands	Electronic intelligence gathering: Also transmits at 2257.530 MHz, thought to be no longer active but detected early 2011
2203.700	USA 205 2009-023A 34903	CW carrier + sidebands	Development of missile sensors: Frequency not measured precisely
2204.400	CBERS 2 2003-049A 28057	CW carrier + sidebands	Remote sensing: China Brazil Earth Resources Satellite, also transmits 180.014 MHz, 480.037 MHz and 2267.500 MHz, ceased to transmit 2007
2204.400	CBERS 2B 2007-042A 32062	CW carrier plus data sidebands	Remote sensing: China Brazil Earth Resources Satellite, also transmits 180.013 MHz, 480.033 MHz and 2267.500 MHz. No longer transmitting - switched off 2010 May 10 after an operating anomaly was detected 2010 March
2205.328	Telecom 2D 1996-044B 24209	CW carrier plus side-bands	Geosynchronous comsat at 8° west longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2205.500	Shi Jian 7 2005-024A 28737	CW carrier + sidebands	Science/technology experiments: Frequency reported 2008, also transmits 2227.500 MHz
2207.130	Telecom 2C 1995-067A 23730	CW carrier plus side-bands	Geosynchronous comsat at 3° east longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2207.487 SGLS 2	GFO 1998-007A 25157	CW carrier plus side-bands	Oceanography - wave height measurement: Geosat Follow On - Also transmitted at 150.012 MHz and 400.032 MHz. Ceased to transmit 2008 November.
2207.500 SGLS 2	AMS 2 1977-044A 10033	CW carrier plus side-bands	Military meteorological satellite: Advanced Meteorological Satellite - Also transmits at 2237.5MHz and 2252.5 MHz - Frequency Information contributed by the late Ivan Artner
2207.500	Jian Bing 3C 2004-044A 28470	CW carrier + sidebands	Military reconnaissance: Frequency reported 2008, also transmits at 2220.5 MHz
2207.510 SGLS 2	USA 172 2003-048A 28054	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2222.5 MHz, 2237.5 MHz and 2247.5 MHz
2207.535 SGLS 2	USA 147 1999-067A 25991	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2252.5 MHz, 150.012 MHz and 400.032 MHz (the last two are the RADCAL frequencies)
2209.797	Huan Jing 1B 2008-041B 33321	CW plus data sidebands	Disaster monitoring within China: Strong, Part of constellation
2212.504	Coriolis	CW carrier plus side-	Military science satellite: Also transmits at 2222.528 MHz

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SGLS 3	2003-001A 27640	bands	
2212.809	Yaogan 3 2007-055A 32289	CW carrier (+sidebands?)	Remote sensing, possible military connection - reportedly equipped with a synthetic aperture radar: May not transmit on all passes - European observations are more common on southbound passes (these occur between passes over the PRC mainland), also transmits 2295.650 MHz
2212.810	Yaogan 1 2006-015A 29092	CW carrier (+sidebands?)	Remote sensing with synthetic aperture radar, government and military: European observations tend to be on southbound passes (these occur between passes over the PRC mainland), also transmits 2295.650 MHz. No longer active - Yaogan 1 broke into several pieces 2010 Feb 4.
2213.600	Shi Jian 6C 2006-046A 29505	CW carrier + sidebands	Science/technology experiments: Frequency reported 2008
2216.525	Yaogan 4 2008-061A 33446	CW carrier (+sidebands?)	Optical remote sensing - military or government: -
2216.527	Yaogan 2 2007-019A 31490	CW carrier (+sidebands?)	Optical remote sensing - military or government: -
2216.527	Yaogan 7 2009-069A 36110	CW Carrier + sidebands	Optical remote sensing - military or government: -
2217.367	Tansuo 2 2004-046A 28479	CW carrier + sidebands	Science/technology experiments: Strong, possibly pulsating rapidly
2217.500 SGLS 4	STS	CW carrier plus side bands carrying data	ISS Crew/payload transport: Integrated voice and data on SGSL Channel 4 - transmitter operates almost continuously while the payload bay doors are open, also transmitted at 259.7 MHz, 1981-2011
2217.500 SGLS 4	Cloudsat 2006-016A 29107	CW carrier + sidebands	NASA - cloud & precipitation studies: Frequency is approximate
2220.476	Yaogan 5 2008-064A 33456	CW carrier (+sidebands?)	Remote sensing, possible military connection - reportedly equipped with a synthetic aperture radar: Also reportedly transmits 2282.1 MHz
2220.500	Jian Bing 3C 2004-044A 28470	CW carrier + sidebands	Military reconnaissance: Frequency reported 2008, also transmits at 2207.5 MHz
2222.476 SGLS 5	USA 152 2000-047A 26473	CW carrier plus side-bands	Military radar reconnaissance satellite: -
2222.481 SGLS 5	USA 172 2003-048A 28054	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2207.5, MHz, 2237.5 MHz and 2247.5 MHz
2222.487 SGLS 5	USA 210 2009-057A 35951	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program
2222.497	USA 191	CW carrier plus side-	Military meteorological satellite: Defense Meteorological Satellite

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SGLS 5	2006-050A 29522	bands	Program - Also transmits at 2237.515 MHz and (according to observations by the late Ivan Artner) at 2249.415 MHz
2222.500 SGLS 5	USA 173 p/I 1 2003-054A 28095	CW carrier plus side-bands	Ocean SIGINT: Navy Ocean Surveillance System - Also transmits at 2232.5 MHz. Frequency Information contributed by the late Ivan Artner
2222.500 SGLS 5	USA 181 p/I 1 2005-004A 28537	CW carrier plus side-bands	Navy Ocean Surveillance System SIGINT: Navy Ocean Surveillance System - also transmits at 2232.5 MHz and 2277.5 MHz - latter frequency Information contributed by the late Ivan Artner
2222.502 SGLS 5	USA 133 1997-064A 25017	CW carrier plus side-bands	Radar imaging reconnaissance: Frequency Information contributed by the late Ivan Artner
2222.508 SGLS 5	USA 69 1991-017A 21147	CW carrier plus side-bands	Radar imaging reconnaissance: Frequency Information originally contributed by the late Ivan Artner - later confirmed by other observers
2222.528 SGLS 5	Coriolis 2003-001A 27640	CW carrier plus side-bands	Military science satellite: Frequency Information contributed by the late Ivan Artner, also transmits at 2212.504 MHz
2224.065	Shenzhou	CW carrier plus side-bands	Piloted spacecraft: Frequency first detected during the Shenzhou 7 mission (2008 September) by Richard Flagg, Hawaii USA - transmission is probably continuous while in orbit
2224.564	Shi Jian 6E 2008-053A 33408	CW carrier + sidebands	Science/technology experiments: -
2227.476 SGLS 6	NATO 4B 1993-076A 22921	CW carrier plus side-bands	Military geosynchronous comsat: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2227.481 SGLS 6	NATO 4A 1991-001A 21047	PSK with sub-carrier, 1024 kHz	Military geosynchronous comsat: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2227.487 SGLS 6	Skynet 4C 1990-079A 20776	CW carrier plus side-bands	Military geosynchronous comsat at 1° west longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2227.497 SGLS 6	Skynet 4E 1999-009B 25639	CW carrier plus side-bands	Military geosynchronous comsat at 53° east longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2227.500	Shi Jian 7 2005-024A 28737	CW carrier + sidebands	Science/technology experiments: Frequency reported 2008, also transmits 2205.500 MHz
2227.508 SGLS 6	Skynet 4D 1998-002A 25134	CW carrier plus side-bands	Military geosynchronous comsat: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2227.514 SGLS 6	Skynet 4F 2001-005B 26695	CW carrier plus side-bands	UK military and government comsat at 6° east longitude: Geosynchronous orbit -
2229.605	Shi Jian 6A 2004-035A 28413	CW carrier + sidebands	Science/technology experiments: -

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2230.795	Tansuo 3 2008-056A 33433	CW carrier + sidebands	Science/technology experiments: Weak
2232.495 SGLS 7	USA 118 1996-026A 23855	CW carrier plus side-bands	Multi-tasking military satellite at 13° west longitude? Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2232.495 SGLS 7	USA 160 p/l 1 2001-040A 26905	CW carrier plus side-bands	Ocean SIGINT: Also reported to transmit 2277.5 MHz
2232.496 SGLS 7	USA 105 1994-054A 23223	CW carrier plus side-bands	Multi-tasking military satellite at 27°.5 west longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2232.497 SGLS 7	USA 159 2001-033A 26880	FM wide-bandwidth data	Geosynchronous missile early warning at 70° east longitude: Defense Support Program also transmits at 2237.5 MHz - Frequency Information contributed by the late Ivan Artner
2232.498 SGLS 7	USA 149 2000-024A 26356	FM wide-bandwidth data	Geosynchronous missile early warning at 8°.5 east longitude: Defense Support Program also transmits at 2237.5 MHz - Frequency Information contributed by the late Ivan Artner
2232.498 SGLS 7	USA 173 p/l 1 2003-054A 28095	CW carrier plus side-bands	Ocean SIGINT: Transmission may be from 28097 (NOSS 3-2 follower). Also reported to transmit at 2222.5 MHz
2232.498 SGLS 7	USA 194 p/l 1 2007-027A 31701	CW carrier + side bands	Navy Ocean Surveillance System - ocean SIGINT: Transmission may be from the NOSS 3-4 follower
2232.498 SGLS 16	USA 198 2007-060A 32378	CW carrier plus side-bands	Intelligence-related satellite, possibly including communications: Navy Ocean Surveillance System
2232.500 SGLS 7	USA 181 p/l 1 2005-004A 28537	CW carrier plus side-bands	Navy Ocean Surveillance System SIGINT: Also reported to transmit at 2222.5 MHz and 2277.5 MHz - latter frequency Information contributed by the late Ivan Artner
2232.504 SGLS 7	USA 197 2007-054A 32287	CW carrier plus side-bands	Geosynchronous missile early warning: Defense Support Program - Frequency Information contributed by Greg Roberts
2232.511 SGLS 7	USA 75 1991-080B 21805	FM wide-bandwidth data	Geosynchronous missile early warning at 38° west longitude: Defense Support Program also transmits at 2237.5 MHz - Frequency Information contributed by the late Ivan Artner
2232.517 SGLS 7	USA 184 2006-027A 29249	CW carrier plus side-bands	US intelligence-related satellite: Also transmits at 2277.5 MHz - Frequency Information contributed by the late Ivan Artner
2234.520	Chang'e 1 2007-051A 32273	CW carrier plus data sidebands and secondary carriers - two modes - 2 MHz bandwidth and 256 kHz bandwidth	Lunar orbiting satellite: Lunar probe built and launched by the Peoples' Republic of China, originally tracked in HEO and then followed to the Moon. Mission ended 2010 Mar 1 when Chang'e made a retrograde rocket firing and impacted the lunar surface.
2235.800	Shi Jian 6B 2004-035B	CW carrier + sidebands	Science/technology experiments: Frequency reported 2008

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	28414		
2235.800	Shi Jian 6F 2008-053B 33409	CW carrier + sidebands	Science/technology experiments: Frequency reported by other observers in 2008, but appears to be silent
2237.480 SGLS 8	USA 149 2000-024A 26356	PSK with sub-carrier, 1024 kHz	Geosynchronous missile early warning at 8° east longitude: Defense Support Program - Also transmits at 2232.5 MHz - Frequency Information contributed by the late Ivan Artner
2237.495 SGLS 8	USA 142 1999-017A 25669	CW carrier plus side-bands	Missile early warning: Defense Support Program, suffered mission failure, satellite stranded in geosynchronous transfer orbit - Frequency Information contributed by the late Ivan Artner
2237.496 SGLS 8	USA 75 1991-080B 21805	CW carrier plus side-bands	Geosynchronous missile early warning at 38° west longitude: Defense Support Program - Also transmits at 2232.5 MHz - Frequency Information contributed by the late Ivan Artner
2237.499 SGLS 8	USA 159 2001-033A 26880	PSK with sub-carrier, 1024 kHz	Geosynchronous missile early warning at 70° east longitude: Also transmits at 2232.5 MHz - Frequency Information contributed by the late Ivan Artner
2237.500 SGLS 8	AMS 2 1977-044A 10033	CW - wide sweeping carrier	Military meteorological satellite: Advanced Meteorological Satellite - Also transmits at 2207.5MHz and 2252.5 MHz
2237.500 SGLS 8	USA 131 1997-012A 24753	CW + side-bands	Military meteorological satellite: Defense Meteorological Satellite Program
2237.512 SGLS 8	USA 172 2003-048A 28054	CW + side-bands	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2207.5 MHz, 2222.473 MHz and 2247.415 MHz
2237.514 SGLS 8	USA 191 2006-050A 29522	CW	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2222.5 MHz and 2247.415 MHz
2237.515 SGLS 8	USA 109 1995-015A 23533	CW + side-bands	Military meteorological satellite: Defense Meteorological Satellite Program
2237.517 SGLS 8	USA 147 1999-067A 25991	CW - wide sweeping carrier	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2207.535 MHz, 2252.5 MHz, 150.012 MHz and 400.032 MHz (the last two are the RADCAL frequencies)
2237.517 SGLS 8	USA 210 2009-057A 35951	CW carrier plus sidebands	Military meteorological satellite: Strong carrier
2237.518 SGLS 8	OPS 3151 1977-007A 9803	CW carrier plus side-bands	DSP - Missile early warning: Defunct satellite in geosynchronous 'graveyard' orbit - Frequency Information contributed by the late Ivan Artner
2241.500	Delta Launch Vehicle (Second Stage)	CW + side-bands	Satellite launches: Detectable during on-orbit launch vehicle operations at start of satellite mission
2241.600	Huan Jing 1A 2008-041A 33320	CW plus data side-bands	Disaster monitoring within China: Part of constellation

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2242.485 SGLS 9	USA 116 1995-066A 23728	CW carrier + sidebands	Digital transmission, multi-tasking reconnaissance satellite: Identified from a single radio observation (early 2008) which is not normally sufficient. However, there is significant circumstantial evidence that the identification is correct. No longer in orbit
2242.485 SGLS 9	USA 129 1996-072A 24680	CW carrier plus sidebands	Imaging reconnaissance: Possible small error in the frequency measurement
2242.485 SGLS 9	USA 161 2001-044A 26934	CW carrier + sidebands	Digital transmission, multi-tasking reconnaissance satellite: -
2242.486 SGLS 9	USA 155 2000-080A 26635	PSK with sub-carrier, 1024 kHz	US intelligence-related satellite near 10° west longitude: Geosynchronous orbit, frequency variable according to onboard power available - increases significantly at times of eclipse. Also transmitted at 251.325 MHz, 252.675, 258.775 and 268.775 MHz. No longer operational.
2242.493 SGLS 9	USA 8 1985-010B 15543	CW carrier plus sidebands	Probably signals intelligence gathering, from geosynchronous orbit: Frequency information from Greg Roberts
2242.495 SGLS 9	USA 137 1998-005A 25148	CW carrier plus sidebands	US comms and intelligence gathering: Part of a constellation of three satellites in highly eccentric orbit (HEO), switches to low power when over the southern hemisphere - formerly transmitted AFSATCOM signal near 243.7 MHz. No longer transmitting - probably since 2010 May. Also lost to visual observers because of changes brought about gravity effects on the eccentric orbit causing perigee to dip low into the atmosphere.
2242.496 SGLS 9	USA 67 1990-097B 20963	PSK with sub-carrier, 1024 kHz	Multi-tasking military satellite near 75° east longitude: Originally GEO but the orbit has evolved to an inclination of 15° and is slightly elliptical so reception varies according to the sub-satellite latitude - a study by Ivan Artner 2006 March showed that the transmitter responds to eclipse periods by becoming intermittent while out of direct sunlight, indicating that the batteries are not charging properly from the solar cells
2242.498 SGLS 9	USA 125 1996-038A 23945	CW carrier plus sidebands	US comms and intelligence gathering: Formerly part of the operational constellation of three SDS satellites in highly eccentric orbit (HEO) - Also transmitted AFSATCOM signal near 243.7 MHz. The S-band transmission from USA-125, an SDS-2 satellite, was at a lower power than the SDS-3 satellites. Ceased to transmit around 2010 Aug 31 when either the transmitter was switched off, or the satellite was guided to a destructive re-entry.
2242.500 SGLS 9	USA 40 1989-061B 20167	CW carrier, oscillates in frequency due to satellite spinning at 5.2s per rev	US multi--tasking intelligence-gathering and communications satellite: Tentative identification of satellite with received signals - non-operational but still transmitting, the signal oscillation is probably due to the originally de-spun aerial platform having matched rotation with the satellite body - identified as 90020 in classfd.tle
2242.500 SGLS 9	USA 89 1992-086B 22518	CW carrier plus sidebands	US multi--tasking intelligence-gathering and communications satellite, now deactivated: During 2006, Ivan Artner tracked a spinning satellite in HEO, the times did not fit known satellites in that type of orbit - it has been tentatively identified as 90026 (last observed in 2004) but transmissions ceased during the first quarter of 2007 before an orbit could be determined, the identification of it as USA-89 is also tentative
2242.500 SGLS 9	USA 162 2001-046A 26948	CW carrier (plus sidebands?)	US intelligence-related satellite near 144° west longitude, possibly including communications: Reported frequency for satellite in geosynchronous orbit - also reported to transmit at 250.075

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			MHz, 256.475, 263.225 and 267.550 MHz
2242.503 SGLS 9	USA 179 2004-034A 28384	CW carrier plus sidebands - strong	US intelligence-related satellite: Part of a constellation of three satellites in highly eccentric orbit (HEO), switches to low power when over the southern hemisphere - Also transmits at 251.700 MHz and 256.375 MHz
2242.504 SGLS 9	USA 198 2007-060A 32378	CW carrier plus sidebands - strong	Intelligence-related satellite, possibly including communications: Part of a constellation of three satellites in highly eccentric orbit (HEO), launched 2007 Dec 10 as a replacement for USA-125, also transmits at 251.700 MHz and 256.375 MHz, and used 251.275 and 258.800 MHz during the orbital test phase up to 2008 Mar 13 Frequency discovered independently by Bob Christy and Sven Grahn about 20 minutes after launch.
2242.504 SGLS 9	USA 227 2011-011A 37377	Carrier + sidebands	US intelligence-related satellite near 10° west longitude: Continuous transmission
2242.505 SGLS 9	USA 186 2005-042A 28888	CW carrier + sidebands	Reconnaissance satellite: -
2242.506 SGLS 9	USA 215 2010-046A 37162	CW	Reconnaissance using radar: Discovered by Bob Christy immediately after launch
2242.506 SGLS 9	USA 234 2012-014A 38109	Carrier + sidebands	Reconnaissance using radar:
2242.514 SGLS 9	USA 224 2011-002A 37348	CW carrier + sidebands	Digital transmission, multi-tasking reconnaissance satellite: Discovered by Bob Christy on day of launch. Intensive radio tracking over first few days allowed good determination of the orbit for acquisition by visual observers.
2242.515 SGLS 9	USA 21 1987-015A 17506	CW carrier, oscillates in frequency due to satellite spinning at 4.6s per rev	US multi--tasking intelligence-gathering and communications satellite: Identification very tentative - highly eccentric orbit, non-operational, the signal oscillation is probably due to the originally de-spun aerial platform having matched rotation with the satellite body, probably an SDS-1 satellite (either F4 or F6) - listed in classfd.tle as 90004
2242.517 SGLS 9	ASTEX 1971-089A 5560	Multiple sidebands - very small dispersion	Technology experiments: Old satellite detected as still transmitting during 2008 March
2246.400	Fengyun 3A 2008-026A 32958	CW carrier + sidebands	Imaging Metsat - geosynchronous orbit: Frequency reported 2008, also transmits 2264.700 MHz, below horizon from UK
2247.478 SGLS 10	TSX-5 2000-030A 26374	CW carrier	Experiments in advanced space technologies: Frequency is unstable, noted as high as 2247.512 MHz, came back on air 2009 November
2247.499 SGLS 10	USA 208 2009-052A 35937	CW carrier plus sidebands	STSS Demonstrator dual satellite mission together with USA 209 testing missile detection technology: Frequency shows variability, possibly due to internal electrical power loading. Transmission frequency sometimes locked to the uplink leading to dual Doppler effect. See 2272.5 MHz for USA-209.
2247.500	NOAA 11	Cyclic carrier - approx 4s	Meteorological imaging: Satellite de-commissioned and batteries

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SGLS 10	1988-089A 19531	on then 4s off	disconnected 2004 Jun 22 at 16:24:28 UTC - output from STX4 transmitter detected 2009 Oct, probably powered by output from solar cells (only detectable on daylight passes)
2247.500 SGLS 10	NOAA 19 2009-005A 33591	Data	Metsat: STX4 transmitter - used during launch and contingency, occasionally heard from orbit and heard to switch on and off, detected 2009 Oct
2249.500	USA 193 2006-057A 29651	CW carrier plus side-bands	US intelligence-related satellite: Satellite failed soon after launch 2006 December - no longer transmitting Frequency Information contributed by the late Ivan Artner
2249.995	Chuang Xin 1-02 2008-056B 33434	CW carrier + sidebands	Earth observation - meteorological data for disaster relief: -
2250.000	Oceansat P2 2009-051A 35931	CW carrier plus sidebands	Ocean Studies: Sun-synchronous orbit, Indian satellite
2250.054	RISat 1 2012-017A 38248	-	Radar imaging: Identified by Sven Grahn on day of launch
2251.446	Shi Jian 6F 2008-053B 33409	CW carrier + sidebands	Science/technology experiments: Relatively strong signal
2252.490 SGLS 11	USA 95 1993-056A 22787	CW carrier plus side-bands	Military geosynchronous comsat: Frequency Information contributed by the late Ivan Artner
2252.490 SGLS 11	USA 146 1999-063A 25967	PSK with sub-carrier, 1.7 MHz	Military geosynchronous comsat: Frequency Information contributed by the late Ivan Artner - co-located so this may be UFO-F11
2252.493 SGLS 11	USA 127 1996-042A 23967	PSK with sub-carrier, 1.7 MHz	Military geosynchronous comsat: Frequency Information contributed by the late Ivan Artner
2252.499 SGLS 11	USA 147 1999-067A 25991	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program - Also transmits at 2207.535 MHz, 2237.5 MHz, 150.012 MHz and 400.032 MHz (the last two are the RADCAL frequencies)
2252.500 SGLS 11	AMS 2 1977-044A 10033	CW carrier plus side-bands	Military meteorological satellite: Advanced Meteorological Satellite - Also transmits at 2207.5 MHz and 2234.5 MHz - Frequency Information contributed by the late Ivan Artner
2252.500 SGLS 11	USA 109 1995-015A 23533	CW carrier plus side-bands	Military meteorological satellite: Defense Meteorological Satellite Program, - Frequency Information contributed by the late Ivan Artner
2252.506 SGLS 11	USA 207 2009-047A 35815	CW carrier + sidebands	Communications: Initial reception reported by Greg Roberts (SA) some 38 minutes after lift-off
2256.251	Shi Jian 6D 2006-046B 29506	CW carrier + sidebands	Science/technology experiments: Weak signal
2257.500 SGLS 12	DSCS III F-1	CW carrier plus side-bands	USA DoD comsat: Possibly defunct, in geosynchronous drift orbit - Frequency Information contributed by the late Ivan Artner

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	1982-106B 13637		
2257.508 SGLS 12	USA 153 2000-065A 26575	PSK with sub-carrier, 1024 kHz	Military geosynchronous comsat at 12° west longitude: Defense Satellite Communications System, geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2257.511 SGLS 12	USA 167 2003-008A 27691	CW carrier plus side-bands	Military geosynchronous comsat at 60° east longitude: Defense Satellite Communications System, geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2257.512 SGLS 12	USA 97 1993-074A 22915	CW carrier plus side-bands	Military geosynchronous comsat at 57° east longitude: Defense Satellite Communications System, geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2257.530 SGLS 12	USA 81 1992-023A 21949	CW carrier plus side-bands	Electronic intelligence gathering: Also transmits at 2202.5 MHz and 258.150 MHz, , frequency may be active intermittently
2262.493 SGLS 13	USA 46 1989-077A 20253	PSK with sub-carrier, 1024 kHz	Military geosynchronous comsat at 15°.5 west longitude: Frequency Information contributed by the late Ivan Artner
2262.499 SGLS 13	USA 174 2003-057A 28117	PSK with sub-carrier, 1.7 MHz	Military geosynchronous comsat at 72° east longitude: Frequency Information contributed by the late Ivan Artner - co-located so this may be UFO-F10
2262.505 SGLS 13	USA 214 2010-039A 36868	CW carrier, for a period after launch, the received frequency was oscillating because of Doppler shift caused by rotation	Advanced comsat for geosynchronous orbit: Unable to reach GEO using designated thrusters so manoeuvred to GEO over a long period using its station-keeping thrusters
2262.507 SGLS 13	USA 164 2002-001A 27168	CW carrier plus side-bands	Military geosynchronous comsat at 28°.5 east longitude: Also transmits 2267.513 MHz, geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2262.509 SGLS 13	USA 99 1994-009A 22988	CW carrier plus side-bands	Military geosynchronous comsat at 39° west longitude: Geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2263.600	Kaguya 2007-039A 32054	CW Carrier plus side-bands	Lunar orbiting satellite: Japanese built and launched lunar probe - easily detectable, can be observed locking-on to, and releasing, the uplink as it appears or disappears at the lunar limb - transmission appears to be continuous
2264.700	Fengyun 3A 2008-026A 32958	CW carrier + sidebands	Imaging Metsat - geosynchronous orbit: Frequency reported 2008, also transmits 2246.400 MHz, below horizon from UK
2264.725	QuikScat 1999-034A 25789	CW + sidebands	Ocean surface wind measurement using radar: Stop-gap mission launched to cover for a similar instrument aboard NSCAT, strong signal
2266.319	Yaogan 8 2009-072A 36121	Weak CW	Remote sensing: -
2267.500	CBERS 2 2003-049A 28057	CW carrier + sidebands	Remote sensing: China Brazil Earth Resources Satellite, also transmits 180.014 MHz, 480.037 MHz and 2204.400 MHz, ceased to transmit 2007
2267.500	CBERS 2B 2007-042A 32062	CW carrier + sidebands	Remote sensing: China Brazil Earth Resources Satellite, also transmits 180.013 MHz and 480.033 MHz and 2204.400 MHz. No longer transmitting - switched off 2010 May 10 after an operating anomaly

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			was detected 2010 March
2267.513 SGLS 14	USA 164 2002-001A 27168	CW carrier plus side-bands	Military geosynchronous comsat at 28°.5 east longitude: Occasional transmission - Also transmits 2262.507 MHz, geosynchronous orbit - Frequency Information contributed by the late Ivan Artner
2270.000	Chibis-M 2011-062C 38051		Lightning studies satellite: Frequency information provided by Sven Grahn
2272.514 SGLS 15	USA 209 2009-052B 35938	CW carrier plus sidebands	STSS Demonstrator dual satellite mission together with USA 208 testing missile detection technology: Frequency shows variability, possibly due to internal electrical power loading. Transmission frequency sometimes locked to the uplink leading to dual Doppler effect. See 2247.5 MHz for USA-208.
2273.520	Haiyang 1B 2007-010A 31113	CW plus data sidebands	Oceanic Remote Sensing: Weak
2277.485 SGLS 16	OPS 4029 1981-107A 12930	CW carrier plus side-bands	Multi-tasking military satellite at 41° west longitude?: Geosynchronous orbit Frequency Information contributed by the late Ivan Artner
2277.500 SGLS 16	USA 78 1992-006A 21873	CW carrier plus side-bands	USA DoD comsat: Defunct satellite in geostationary drift orbit - Frequency Information contributed by the late Ivan Artner
2277.500 SGLS 16	USA 105 1994-054A 23223	CW carrier plus side-bands	Multi-tasking military satellite at 27°.5 west longitude: Frequency Information contributed by the late Ivan Artner
2277.500 SGLS 16	USA 160 p/I 1 2001-040A 26905	CW carrier plus side-bands	Ocean SIGINT: Navy Ocean Surveillance System - Frequency Information contributed by the late Ivan Artner, also transmits at 2232.5 MHz
2277.500 SGLS 16	USA 181 p/I 1 2005-004A 28537	CW carrier plus side-bands	Navy Ocean Surveillance System SIGINT: Navy Ocean Surveillance System, also transmits at 2222.5 MHz and 2232.5 MHz
2277.520 SGLS 16	USA 184 2006-027A 29249	CW carrier plus side-bands	US intelligence-related satellite: Also transmits at 2232.5 MHz - Frequency Information contributed by the late Ivan Artner
2280.716	Yaogan 6 2009-021A 34839	CW carrier (+sidebands?)	Digital imaging for remote sensing, government/military use: Weak, also reported at 2296.500 MHz
2282.100	Yaogan 5 2008-064A 33456	CW carrier (+sidebands?)	Remote sensing, possible military connection - reportedly equipped with a synthetic aperture radar: Frequency reported 2008, also transmits 2220.476 MHz
2282.500 SGLS 17	MSX 1996-024A 23851	AM - 1 kHz tone	Missile detection experiments: Midcourse Space Experiment, infrared sources with a view to improved design of missile detecting sensors - Frequency Information contributed by the late Ivan Artner
2282.500 SGLS 17	AIM 2007-015A 31304	FM	NASA - atmospheric studies: Indistinct lines when viewed with SDR and software
2282.507	USA 32	CW carrier plus side-	Electronic intelligence gathering: Observed to switch on and off

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SGLS 17	1988-078A 19460	bands	and does not transmit every rev - at least while over Europe, also transmits 2202.5 MHz but transmissions at the two frequencies are not simultaneous
2285.525	ZP-1A-2 2010-047C 37167	Weak CW	Microelectronics studies: -
2286.000	Cosmos 2469 2010-049A 37170		Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2298.000 MHz, operates only above the northern hemisphere
2286.001	Cosmos 2422 2006-030A 29260	CW carrier plus sidebands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2292.001 MHz, operates only above the northern hemisphere
2286.001	Cosmos 2469 2010-049A 37170	CW	Missile early warning: Transmission not continuous, also transmits 2292.001 MHz
2287.500 SGLS 18	Aqua 2002-022A 27424	CW carrier + sidebands	Climate research: Frequency is +/-10 kHz
2287.500 SGLS 18	Aura 2004-026A 28376	CW carrier + sidebands	Climate research: Frequency is +/-10 kHz
2292.000	Cosmos 2469 2010-049A 37170		Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2298.000 MHz, operates only above the northern hemisphere
2292.001	Cosmos 2422 2006-030A 29260	CW carrier plus sidebands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2286.001 MHz, operates only above the northern hemisphere
2292.001	Cosmos 2469 2010-049A 37170	CW	Missile early warning: Transmisiion not continuous, also tranmits 2286.001 MHz
2295.650	Yaogan 1 2006-015A 29092	CW carrier (+sidebands?)	Remote sensing with synthetic aperture radar, government and military: Frequency reported 2008, also transmits 2212.810 MHz. No longer active - Yaogan 1 broke into several pieces 2010 Feb 4.
2295.650	Yaogan 3 2007-055A 32289	CW carrier (+sidebands?)	Remote sensing, possible military connection - reportedly equipped with a synthetic aperture radar: Frequency reported 2008, also transmits 2212.810 MHz
2296.500	Yaogan 6 2009-021A 34839	CW carrier (+sidebands?)	Digital imaging for remote sensing, government/military use: Frequency reported 2008, also transmits 2280.716 MHz
2298.000	Cosmos 2388 2002-017A 27409	CW carrier plus sidebands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmitted at at 2298.0 MHz - ceased to operate 2006 November
2298.000	Cosmos 2393 2002-059A	CW carrier plus sidebands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmitted at 2286.0 MHz - ceased to operate 2007 March

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	27613		
2298.000	Cosmos 2430 2007-049A 32268	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2304.0 MHz, operates only above the northern hemisphere
2298.000	Cosmos 2446 2008-062A 33447	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2304.000 MHz, operates only above the northern hemisphere
2304.000	Cosmos 2388 2002-017A 27409	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmitted at 2298.0 MHz - ceased to operate 2006 November
2304.000	Cosmos 2393 2002-059A 27613	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmitted at 2286.0 MHz - ceased to operate 2007 March
2304.000	Cosmos 2430 2007-049A 32268	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2298.0 MHz, operates only above the northern hemisphere
2304.000	Cosmos 2446 2008-062A 33447	CW carrier plus side-bands	Missile early warning: OKO satellite in highly eccentric orbit - Also transmits at 2298.000 MHz, operates only above the northern hemisphere